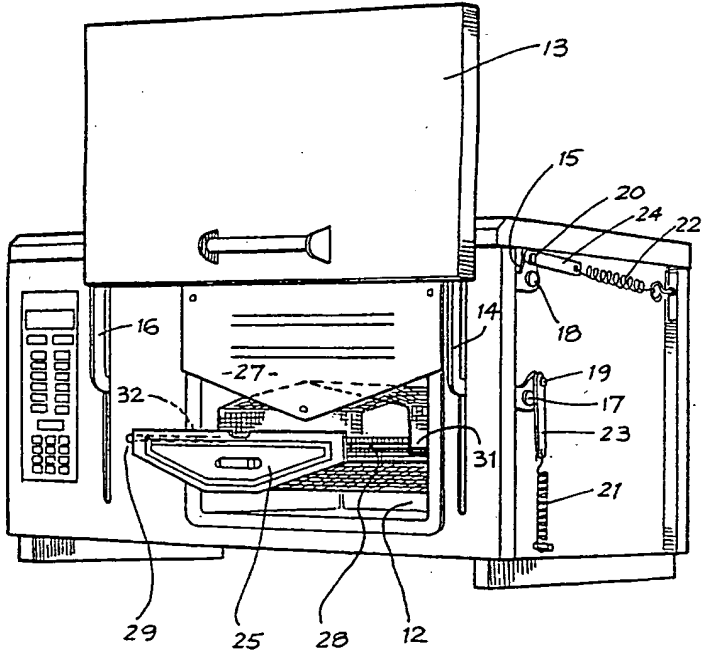




## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

<p>(51) International Patent Classification<sup>4</sup> : F24C 15/32, A47J 37/04 A23N 12/10</p>	<p>A1</p>	<p>(11) International Publication Number: WO 86/ 04978 (43) International Publication Date: 28 August 1986 (28.08.86)</p>
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<p>(54) Title: HOT AIR OVEN WITH A HORIZONTAL ROTARY COOKING BASKET</p>  <p>(57) Abstract</p> <p>A hot air oven with a gas permeable basket (25, 26) mounted for rotation about a horizontal axis within the oven cavity (12) of the oven. Food to be cooked is placed in the basket and hot air is rapidly circulated through the oven and the basket is rotated. The oven door (13) opens vertically on a parallelogram linkage (14, (15), (16).</p>		

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## HOT AIR OVEN WITH A HORIZONTAL ROTARY COOKING BASKET

This invention relates to ovens which are adapted to cook pieces of food by means of a stream of hot air (which does not necessarily entail the use of atmospheric air), and has especial application to relatively small such ovens which are suitable for cooking potato chips and similar foods in restricted cooking areas without the use of fat.

Known ovens which cook by means of a stream of hot air are used in commercial installations where large quantities of foods must be cooked relatively quickly, and have the incidental advantage that food cooked in them, being relatively free of cooking fats and oils, has a good taste and good dietary properties. The elimination of cooking fats and oils especially improves the cooking of potato chips, and these, as well as other foods such as pumpkins, onions and meats, could be beneficially and economically cooked by hot gases if existing ovens were less large and inflexible, and did not emit excessive amounts of heat which cause difficulties when the ovens are installed in restricted cooking areas.

A hot air oven constructed according to this invention includes a thermally insulated cooking compartment having an opening thereinto and a door which is operable to open and close such opening, a gas-permeable basket, means for mounting the basket in the cooking compartment, means for rotating the basket about an axis of rotation passing through the basket when the basket is so mounted, a hot air generator, and a duct arranged to receive hot air from the generator and to direct such hot air to the basket when the basket is mounted as aforesaid.

The cooking compartment, hot air generator and duct are preferably mounted in, and the door is preferably mounted on, a cabinet. The cabinet is preferably adapted to be supported by a horizontal surface such as the top of

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a bench. When the hot air generator is disposed to a side of the basket, the cabinet can have a relatively low, elongated shape which can readily fit into a space in a cooking area. No special floor space need be set aside  
5 for such an oven and, consequently, it is not restricted to commercial use but can be purchased for domestic use without requiring the replacement of an existing floor-standing oven.

The conventional oven door is horizontally pivotted  
10 below the cooking compartment opening so that it opens by swinging downwardly to extend horizontally outwardly from the oven and, in combination with the fact that hot air ovens generate large amounts of heat, this causes problems when food is being removed from a conventional oven. The  
15 first problem is that when such a door is opened, hot gases escape from the cooking compartment onto the face of the person opening the door. Such gases include hot steam. The second problem is that the door itself becomes very hot and, since it projects into the cooking area when  
20 open, can inflict burns on a person using the oven. The projecting door makes it difficult to remove a container of cooked food without making accidental contact with the door.

Independently of heat problems, a horizontally,  
25 projecting door occupies space in a cooking area, and this can make the use of known hot air ovens impractical in restricted cooking areas such as milk bar counters.

Accordingly, the door of the oven according to this invention is preferably mounted to move upwardly from its  
30 closed position to an open position in which the door extends substantially vertically upwardly. Such a door may be mounted on a parallelogram linkage, a vertically sliding carriage, or any other suitable mounting means. Preferably, also, the oven includes means for releasably  
35 holding the door in its open position. Such means may

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comprise a releasable catch or, preferably, biasing means such a spring or springs, or a weight or weights. The oven may also include means such as a spring or springs for pressing the door closed when it is in its closed position to reduce the escape of hot gases during cooking. The door may be removable for cleaning.

Preferably, the cooking compartment is provided with a removable liner. In a preferred embodiment, the cooking compartment walls and the liner are made of stainless steel.

The basket preferably comprises a gas-permeable wall substantially surrounding the axis of rotation of the basket, preferably completely surrounding it so that the basket can be rotated through a complete circle while full of food. For the best cooking performance, the basket should be substantially radially symmetrical about the axis of rotation and the best basket is a cylinder the axis of which should be as close as possible to the axis of rotation.

The basket is gas-permeable both to allow passage of the hot cooking air through the basket and to allow steam from the food to escape. Cooking in a stream of hot air causes foods to emit large quantities of steam and potato chips, for example, can lose eighty per cent of their weight in steam. The basket can be made of, for example, a perforated sheet material, an expanded metal mesh, woven wire, or longitudinally extending, closely spaced bars.

The basket can be loaded with food through an opening provided in any convenient part of the basket and, when the basket is to be rotated through a full circle, means for closing the opening should be provided. In a preferred embodiment, the basket is divided longitudinally relative to the axis of rotation into two parts which can be separated, one of such parts being loaded with food before assembly of the basket for cooking. Such parts are

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preferably engageable with each other by sliding, for example by sliding fitting of a flange on one part into a channel on the other. In the preferred embodiment, the basket is cylindrical, one semi-cylinder (i.e. a part  
5 semi-circular in cross-section) part being rigidly attached to a central axle which connects with the mounting means and the other semi-cylindrical part being slidably removable for loading and unloading of the food.

For efficient utilisation of the heat and uniform  
10 appearance of the cooked food, all sides of the pieces of food should preferably be exposed to the hot cooking gases. Some foods, such as potato, are very sensitive to variations in cooking temperature and non-uniform heating can produce undesirable tastes, in the case of potato a  
15 bitter taste. For this reason, the basket is preferably adapted to tumble the food in it as it rotates. Such adaptation may be embodied in the shape of the basket itself, but can also be embodied in tumbling bars projecting inwardly of the basket. Such tumbling bars can  
20 extend the whole length of the basket relative to the axis of rotation.

In domestic applications, more or less vigorous tumbling may be required according to the nature of the food being cooked - for example, a tumbling action  
25 suitable for potato chips may remove batter from foods such as battered prawns. Adjustable tumbling may be achieved by providing removable tumbling bars so that bars can be removed for less vigorous tumbling. Additionally or alternatively, the size and shape of the tumbling bars,  
30 and the angle they make with the basket, may be adjustable to vary the tumbling action.

The basket may be mounted in the cooking compartment by an axle the ends of which extend out of the basket and are supported in the compartment. Such an axle may be  
35 longitudinally slidable into and out of the basket. The

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axle may be supported by downwardly-extending supports in the cooking compartment, such as V-shaped assemblies of rods or plates provided with holes to receive the axle. Alternatively, the basket may be supported by rollers  
5 received in circumferential tracks provided on the basekt. In all cases the axis of rotation of the basket preferably extends through the opening of the cooking compartment.

The means for rotating the basket can be any  
10 conventional motor adapted to produce rotation by way of, for example, an axle or roller supporting the basket. There may be means for varying the speed of rotation to influence the tumbling action, and the rotation may be unidirectional or oscillating which will also affect the  
15 tumbling of the food.

The hot air generator may be a fan arranged to cause air to flow through an electric heating element, and the element may be wired to produce a variable heat output as required. The oven preferably includes a duct or ducts  
20 for returning air from the oven for reheating. The oven preferably includes a steam condenser which is provided with an exhaust port so that steam emitted by the cooking food can be safely removed from the oven during the cooking. Such a condenser may conveniently be mounted  
25 above the cooking compartment and may be supplied through steam exhaust slots in the roof of the oven, and/or may be situated in a duct for returning air to the element for reheating.

The oven may include controls which regulate the  
30 operation of its parts for reasons of safety. For example, the heating element may be prevented from operating when the fan is not operating, and a switch may turn the fan off when the door is opened. Additionally, the controls may include means for automatically  
35 regulating the operation of the oven to produce, for

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example, a normal cooking cycle in which a preset tumbling action is performed for a preset time at a preset temperature, a pre-cook cycle in which the surface of the food is sealed by a blast of particularly hot air before normal cooking begins, and a holding cycle in which cooked food is kept at a preset temperature by intermittent operation of the hot air generator.

A preferred embodiment of the present invention will now be described by way of example with reference to the accompanying drawings in which:-

Fig. 1 illustrates an oven in accordance with the present invention with the door open and the lower half of the chip basket partly removed;

Fig. 2 illustrates the oven of Fig. 1 with the right hand side cover removed to show the parallelogram door linkage arrangement with the door open;

Fig. 3 illustrates the oven of Fig. 1 with the lower half of the chip basket removed;

Fig. 4 illustrates the oven of Fig. 1 with the right hand side cover removed to show the parallelogram door linkage arrangement when the door is closed;

Fig. 5 schematically illustrates a front view of the internal arrangement of the oven of Fig. 1 showing the air flow therethrough;

Fig. 6 schematically illustrates a side view of the internal arrangement of the oven of Fig. 1 showing the mounting arrangement for the chip basket, and

Fig. 7 schematically illustrates the internal arrangement of the air heating compartment of the oven of Fig. 1.

Referring now to Fig. 1 of the drawings, the illustrated oven 10 comprises an outer casing 11, which houses the various fans, motors and electronic controls of the oven, as well as an inner oven chamber which is surrounded by insulation. Within the oven chamber is



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housed a removable metal box which defines the oven cavity 12 and which is closed by a vertically opening door 13. The various side and top panels of the casing are removable to provide access to the internal components of the oven.

Turning to Fig. 2, the door 13 of the oven cavity 12 is hinged by a parallelogram linkage comprising 4 L-shaped arms (only 3 shown) 14, 15, 16 each of which is pivotally connected at one end to the door and at the other end to the oven chassis. Adjacent to the pivotal connections 17, 18 of the arms 14, 15 to the chassis, each of the arms is provided with a small inplane projection 19, 20 to which a spring 21, 22 is connected via a connecting member 23, 24. The other end of each of the springs 21, 22 is connected to the chassis under tension to provide overcentre door retaining devices for holding the door open or alternatively pulling the door tightly closed. Similar devices are provided on the L-shaped arms suspending the other side of the door, but are not illustrated. Fig. 4 illustrates the parallelogram door linkage when the door is closed.

The chip basket comprises a fixed, nominally upper, half 26 and a removable lower half 25, the upper and lower halves being joined by co-operating tongue 28, 29 and grooves 31, 32 to allow the lower half 25 to be slidably engaged with, and disengaged from, the upper half 26. The upper half 26 of the basket is rotatably suspended from a bracket 27 at the front of the oven and engages with the shaft of a drive motor 30 (ref. Fig. 6) mounted on the outside rear surface of the oven chamber, the shaft projecting into the oven cavity 12. The axis of rotation of the chip basket is substantially along the central axis of the basket when the two halves are joined, thereby allowing foods contained in the basket to be tumbled and redistributed in the basket during cooking. The basket

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itself has gas permeable sides to allow the passage of hot gases therethrough during the cooking process. Typically, the basket could be fabricated with perforated metal wire mesh or wire grill sides.

5 Referring to Fig. 3, with the chip basket 25,26 and the mounting bracket 27 removed, the air inlet vent 34 and return vent 33 are visible, as well as a plurality of shelf supports 35 which allow the positioning of shelves in the oven for supporting food items which do not  
10 require, or are unsuitable for, tumbling.

Referring to Fig. 5, the internal arrangement of the oven is schematically illustrated, and it will be seen that the removable oven cavity 12 is located within an oven chamber 36 which is in turn surrounded by insulating  
15 material 37 in order to prevent the conduction of heat through the oven walls. Air is circulated within the oven chamber 36 and cavity 12 by a radial fan 38 driven by a motor 39. The fan 38 draws air from the cavity 12 via the return air vent 33 and blows the air over the heating  
20 elements 41 and back via the inlet vent 34.,

Fig. 6 schematically illustrates the oven cavity 12 when viewed from the side, showing the relationship between the chip basket supporting bracket 27. The chip basket 25,26 and the drive motor 30 which rotates the chip  
25 basket.

Fig. 7 schematically illustrates the arrangement of elements in the air heating chamber when viewed from the side. Air is drawn through the return air vent 33 by the fan 38, as previously described, and is blown over heating  
30 elements 41. A barrier 42 is provided about the fan 38 and heating elements 41 to guide the air over the heating elements and up towards the air delivery vent 34, through which it is returned to the oven cavity 12.

It will be recognised from the foregoing general  
35 description that the described embodiment is sufficiently

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flexible in its application to be useful for the cooking of foods not previously able to be cooked in a stream of hot air, and for cooking in locations not previously suitable for hot air ovens. It will also be appreciated

5 that various preferable and optional features of the design may be altered without departing from the general spirit or scope of the described invention.

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The claims defining the invention are as follows:-

1. The present invention consists in a hot air oven comprising a thermally insulated cooking compartment having an opening thereinto and a door which is operable to open and close such opening, a gas-permeable basket, means for mounting the basket in the cooking compartment, means for rotating the basket about an axis of rotation passing through the basket when the basket is so mounted, a hot air generator, and a duct arranged to receive hot air from the generator and to direct such hot air to the basket when the basket is mounted as aforesaid.
2. The oven as claimed in claim 1 wherein the basket has two parts, one of which is rotatably mounted in the oven and the second of which is slidably engagable with the first part to form a closed substantially cylindrical gas permeable container the second part of the basket being removable from the first for loading food into the basket without removing the first part of the basket from the oven.
3. The oven as claimed in claim 2 wherein the axis of rotation of said basket is a horizontal axis passing substantially along the longitudinal axis of the basket.
4. The oven as claimed in any one of the preceding claims wherein the door is mounted on a parallelogram linkage adapted to allow the door to be opened by lifting it outwardly and upwardly from the oven opening.
5. The oven as claimed in claim 4 wherein the parallelogram linkage is provided with oven centre means resiliently biased to urge the door toward the fully open position when the door is nearing the fully open position and to hold the door tightly closed when in the closed position.

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6. The oven as claimed in any one of the preceding claims wherein the cooking compartment comprises a removably cavity located within an insulated chamber housing a gas circulating fan and a heating element.

7. The oven as claimed in claim 6 wherein the circulating fan draws gas from the cavity through a first vent therein and blows the gas over said heating elements.

8. The oven as claimed in claim 7 wherein gas directing means are provided for directing the gas blown over the heating elements towards a second vent in the cavity through which the heated gas is passed into the cavity.

9. The hot air oven substantially as hereinbefore described with reference to the accompanying drawings.

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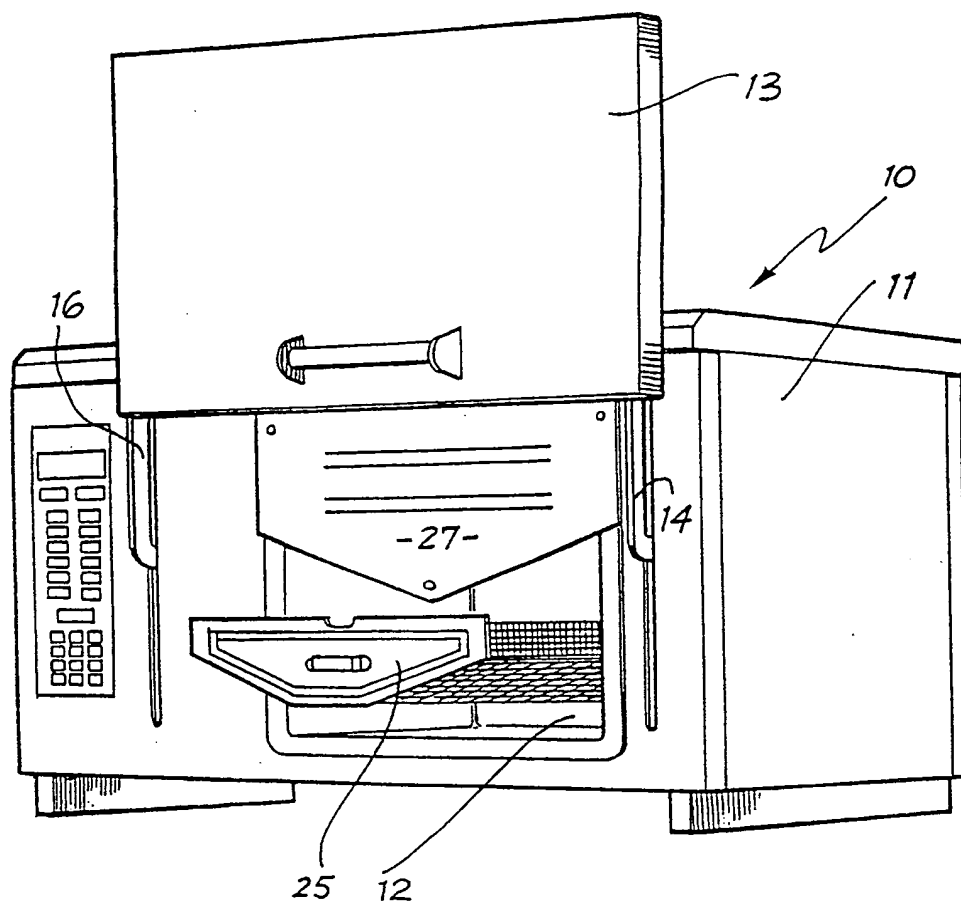


FIG. 1

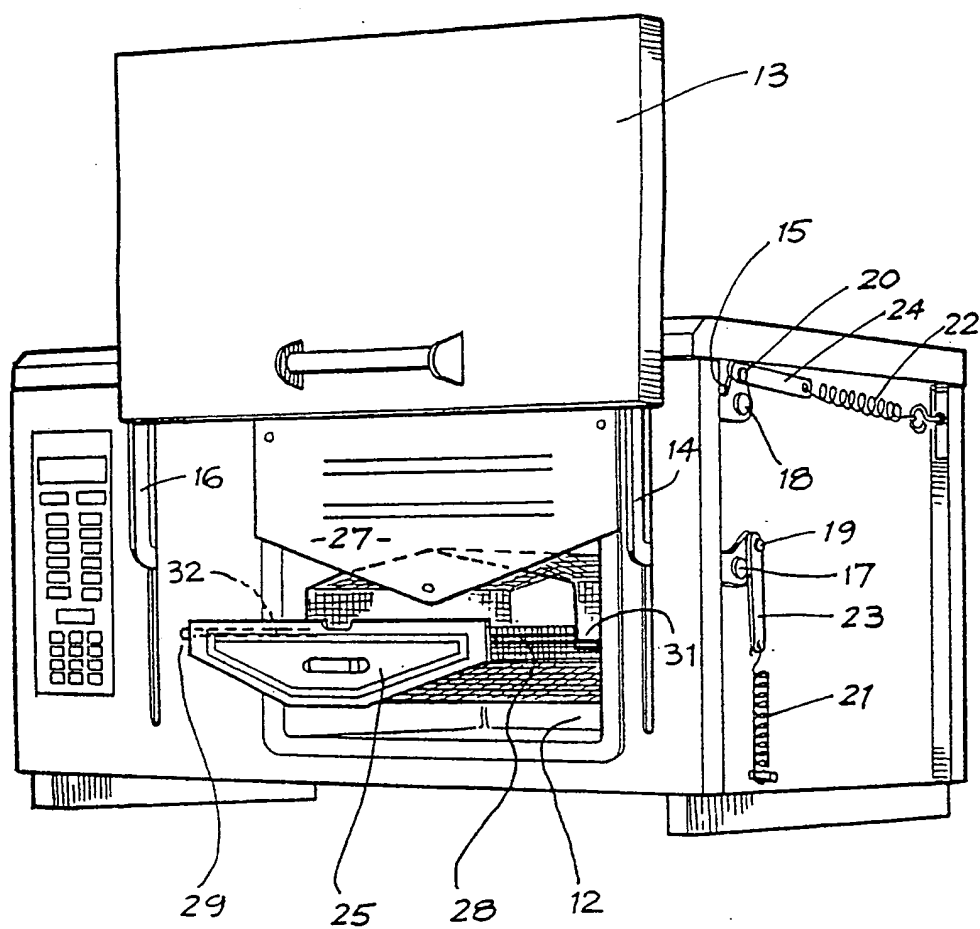


FIG. 2

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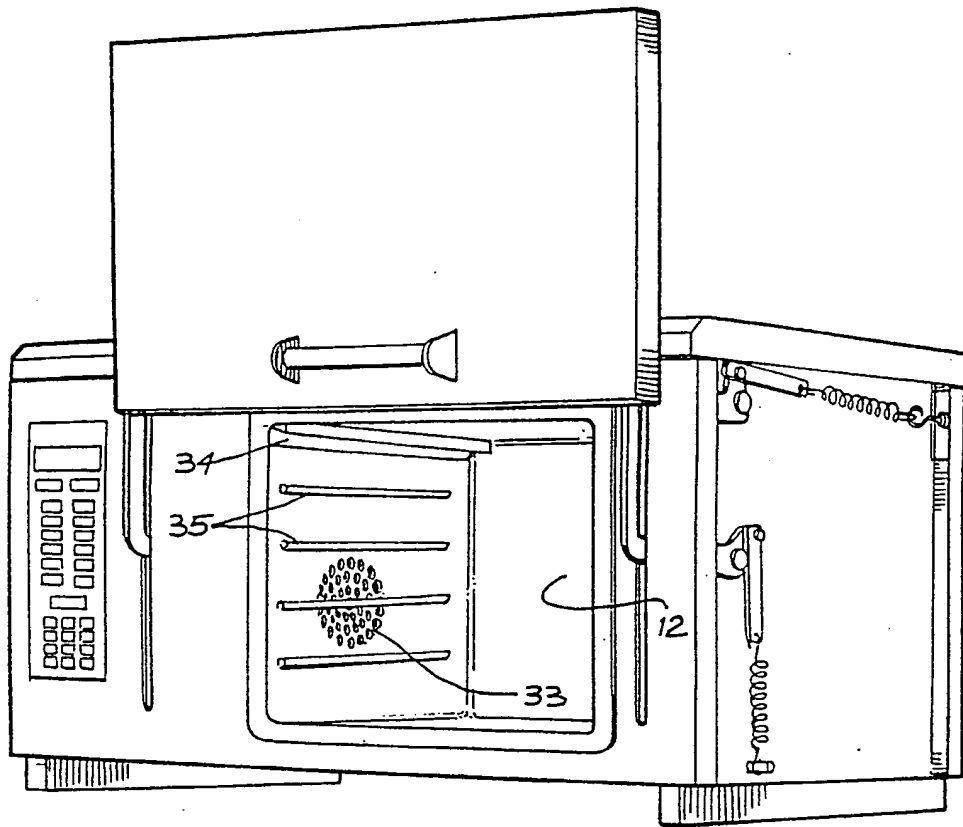


FIG. 3

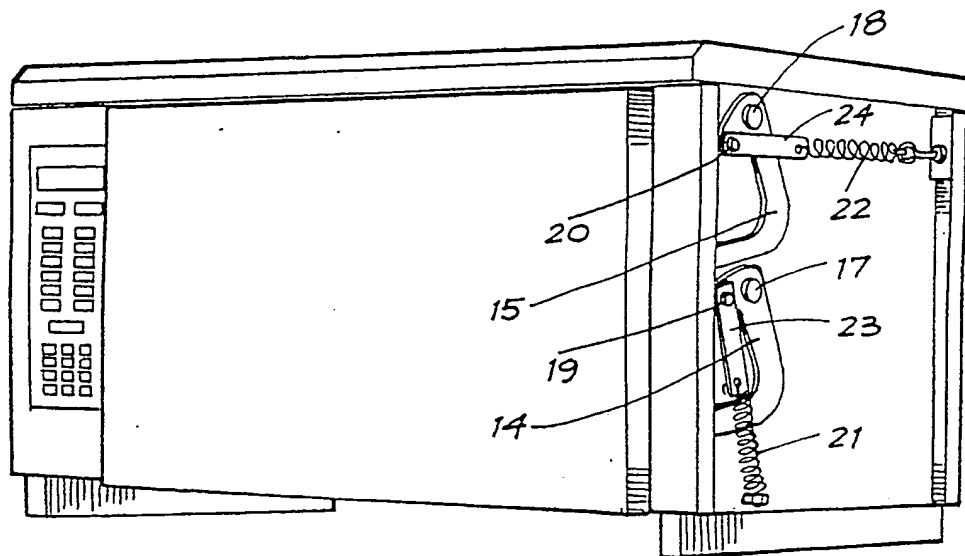
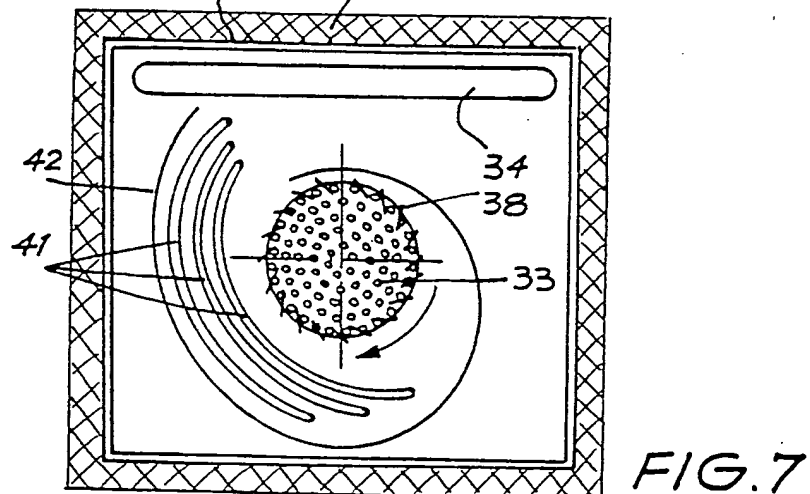
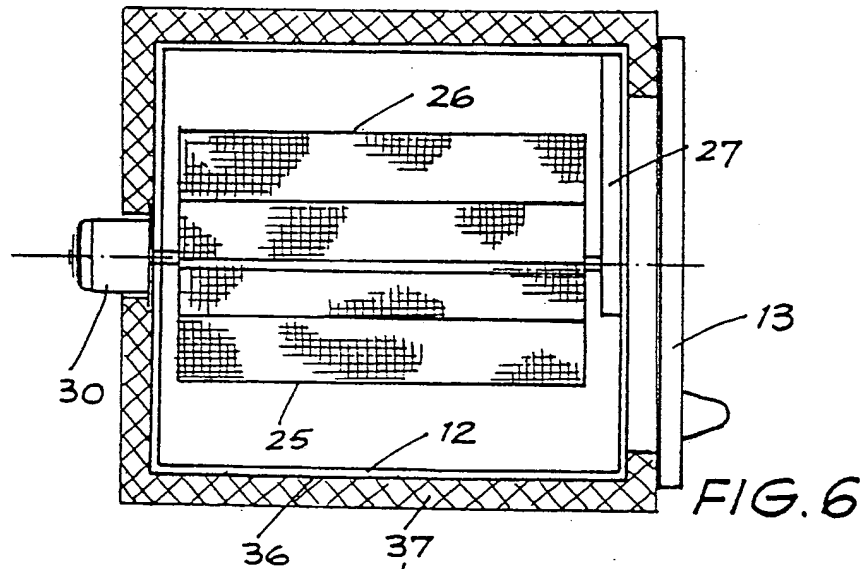
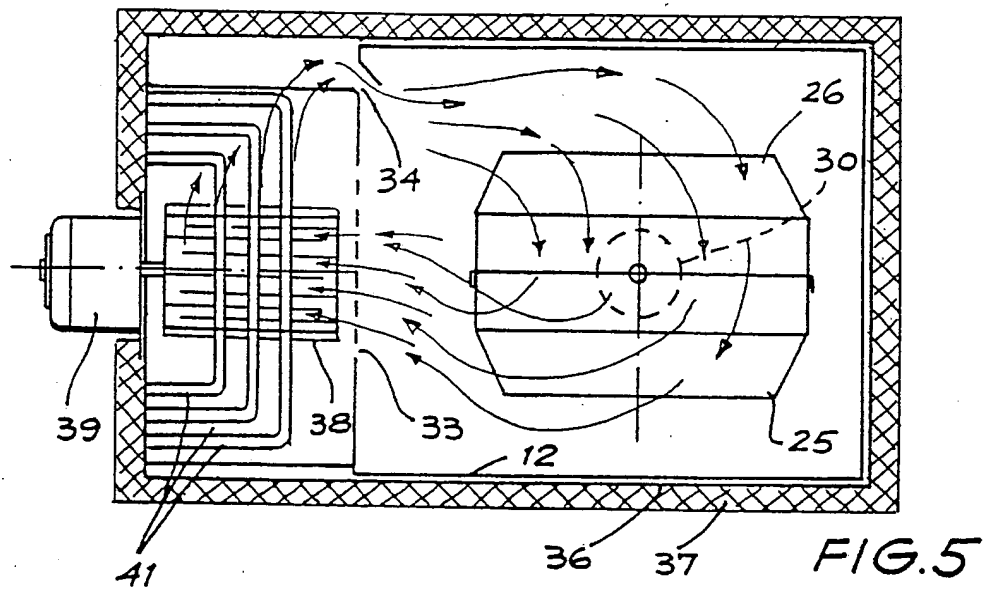



FIG. 4





# INTERNATIONAL SEARCH REPORT

International Application No. PCT/AU 86/00028

<b>I. CLASSIFICATION OF SUBJECT MATTER</b> (1) (2) (3) (4) (5) (6) (7) (8) (9) (10) (11) (12) (13) (14) (15) (16) (17) (18) (19) (20) (21) (22) (23) (24) (25) (26) (27) (28) (29) (30) (31) (32) (33) (34) (35) (36) (37) (38) (39) (40) (41) (42) (43) (44) (45) (46) (47) (48) (49) (50) (51) (52) (53) (54) (55) (56) (57) (58) (59) (60) (61) (62) (63) (64) (65) (66) (67) (68) (69) (70) (71) (72) (73) (74) (75) (76) (77) (78) (79) (80) (81) (82) (83) (84) (85) (86) (87) (88) (89) (90) (91) (92) (93) (94) (95) (96) (97) (98) (99) (100)		
According to International Patent Classification (IPC) or to both National Classification and IPC Int. Cl. <sup>4</sup> F24C 15/32, A47J 37/04, A23N 12/10		
<b>II. FIELDS SEARCHED</b>		
Minimum Documentation Searched <sup>1</sup>		
Classification System	Classification Symbols	
IPC	F24C 15/32, A47J 37/04, A23N 12/10	
Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched <sup>2</sup>		
AU : IPC as above		
<b>III. DOCUMENTS CONSIDERED TO BE RELEVANT<sup>3</sup></b>		
Category <sup>4</sup>	Citation of Document, <sup>5</sup> with indication, where appropriate, of the relevant passages <sup>12</sup>	Relevant to Claim No. <sup>13</sup>
X,Y	US,A, 4295419 (LANGHAMMER) 20 October 1981 (20.10.81)	1-8
X,Y	AU,A, 10790/83 (POULSON) 10 November 1983 (10.11.83)	1-8
X,Y	US,A, 4155294 (LANGHAMMER) 22 May 1979 (22.05.79)	1-8
Y	AU,B, 55325/65 (291153) (DRAFFIN BROTHERS PTY LTD) 24 August 1967 (24.08.67)	4-5
X	US,A, 4203358 (VOGT) 20 May 1980 (20.05.80) See Figure 1	1
X	AU,B, 42848/68 (445938) (VOGT) 12 March 1970 (12.03.70) See Figure 3	1
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<b>IV. CERTIFICATION</b>		
Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report	
17 April 1986 (17.04.86)	(24-04-86) 24 APRIL 1986	
International Searching Authority	Signature of Authorized Officer	
Australian Patent Office	 D. HERALD	

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	JP 58195719	NL 8301377	NO 830321		
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